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An Analysis of Ninety Cases
of Simple Chronic
Glaucoma,

*With Special Reference to the Effects of
Iridectomy on the Acuity of Vision
and the Visual Field.*

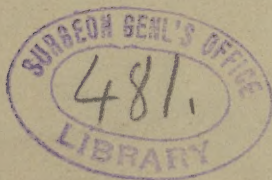
BY

CHARLES STEDMAN BULL, M. D.,

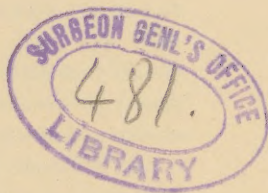
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TO ST LUKE'S HOSPITAL.

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AN ANALYSIS OF NINETY CASES OF SIMPLE CHRONIC GLAUCOMA,

WITH SPECIAL REFERENCE TO THE EFFECTS OF
IRIDECTOMY ON THE ACUITY OF VISION AND THE VISUAL FIELD.*

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THE remarks embodied in this paper are based upon a careful analysis of ninety cases of simple chronic glaucoma which the writer was enabled to follow out for a varying length of time subsequent to operation. They embrace all the facts in regard to each case which have any bearing upon the subject of the effects of iridectomy upon the acuity of vision and the state of the visual field. The cases extend over a period of about seventeen years, were all examined and treated by the reporter, and the conclusions drawn are therefore derived merely from his own personal experience.

Of the ninety cases under consideration, forty-four were in males and forty-six in females, the cases being nearly equally divided between the sexes. The age of the patients varied between twenty-four and eighty-six years.

In the decade between twenty and thirty there were

* Read before the American Ophthalmological Society at its twenty-fifth annual meeting.

two cases; between thirty and forty, seven cases; between forty and fifty, sixteen cases; between fifty and sixty, twenty-four cases; between sixty and seventy, thirty-three cases; between seventy and eighty, four cases; and between eighty and ninety, four cases.

Of the ninety patients, seventy-seven were Christians and only thirteen were Hebrews. This is contrary to the usually accepted belief that the Hebrew race is peculiarly prone to this disease.

The refraction of the one hundred and eighty eyes of these ninety patients varied as follows: Simple hypermetropia existed in one hundred and five eyes, simple myopia was found in ten eyes, and emmetropia existed in six eyes. Simple hypermetropic astigmatism was found in ten eyes. Compound hypermetropic astigmatism was met with in twenty-four eyes, and compound myopic astigmatism in two eyes. In two eyes a condition of phthisis bulbi prevented any measure of the refractive condition, and in eighteen eyes the advanced state of the cataract present was an obstacle to the same end.

The cornea was more or less cloudy in the right eye in five cases and in the left eye in five cases.

The anterior chamber was shallow in one eye in thirty-four cases and in both eyes in forty-one cases. It was of normal depth in twenty-five eyes, and was entirely abolished in twenty-eight eyes.

The iris was more or less movable in all the cases except in those eyes in which the condition was that of absolute glaucoma.

The lenses were entirely clear in one hundred and twenty-two eyes—sixty-three on the right side and fifty-nine on the left side. There were slight peripheral opacities in the lens in thirty-five eyes—nineteen on the right side and sixteen on the left side. There was cataract in an advanced

stage in eighteen eyes—in six cases in the right eye and in twelve cases in the left eye.

Phthisis bulbi existed in one eye in two cases. In one of these cases the eye had been lost in childhood from purulent conjunctivitis, and in the other case the loss of the eye was due to traumatism, and occurred in childhood or early youth.

The glaucomatous excavation of the optic disc was very deep in one hundred and six eyes, moderate in depth in forty-eight eyes, and in seven eyes there was no excavation demonstrable, though there were both diminution of vision and narrowing of the visual field.

The condition of the field of vision varied greatly, and is worthy of close and attentive study. In five cases it was contracted in one eye and normal in the other. In eighteen cases it was contracted in one eye, and either telescopic or entirely absent in the other. In thirty-nine cases it was contracted in both eyes. In seven cases there was no measurable field in one eye, and in the other there was absolute glaucoma. In twelve cases it was contracted in one eye moderately, and there was absolute glaucoma in the other. In six cases there was no measurable field in either eye. In three cases there was no limitation of the field in either eye. In one case there was absolute glaucoma in one eye and a perfectly normal field in the other.

Among the ninety cases, or one hundred and eighty eyes, there were twenty-two eyes afflicted with absolute glaucoma—nine on the right side and thirteen on the left side. In each of these cases the other eye was the seat of simple chronic glaucoma.

The intra-ocular tension was increased in both eyes in seventy-five cases. It was increased in the right eye alone in eight cases and in the left eye alone in six cases. The tension was normal in both eyes in three cases, in the right

eye alone in four cases, and in the left eye alone in eight cases. The tension was diminished in the right eye in two cases.

One of the most doubtful points in the history of the development of simple chronic glaucoma is the determination of the interval between the outbreak of the disease in the two eyes. In the majority of the cases the patients are unable to determine how long an interval existed between the beginning of the attack in the two eyes, and in many instances the statement of a simultaneous attack in both eyes is of very doubtful value. Among the ninety patients under consideration, sixty-four were unable to give any opinion as to the length of interval between the attacks in the two eyes, and many of these stated vaguely that the disease began simultaneously in both eyes. In twenty-six cases the interval was known with tolerable accuracy, and varied between two months and twelve years. In twenty-eight cases the right eye was the first attacked, and in twenty-two cases the disease began in the left eye.

In all the ninety cases the only operation done was an iridectomy, always broad and usually upward, and in the majority of cases the instrument used was the ordinary lance-knife. In no case was the operation followed by an extraordinary amount of hæmorrhage, nor by any symptom pointing to malignant complication. In forty-five cases a simultaneous iridectomy was done on both eyes. In seventeen cases an iridectomy was done on one eye, and was followed at a varying interval by an iridectomy on the fellow-eye. In eight cases an iridectomy was done on one eye only, the other eye remaining normal as long as the patient was under observation, which, in many instances, extended over a period of years. In two cases two iridectomies were done upon one eye, with an interval between them. In one case an immature cataract was extracted at the time of the operation of iridectomy. In one case a sensitive atrophied

stump was enucleated, preliminary to an iridectomy on the other eye. In twenty cases an iridectomy was done on one eye, the other eye being blind from absolute glaucoma.

In all these cases of simple chronic glaucoma the chief interest centers in the state of the acuity of vision and the *prognosis* as to the results of an operation. To this end an accurate history was kept of each case, with special reference to vision and the visual field, before and after the operation for a varying length of time, which, in some cases, extended over a period of years, and the result is very far from encouraging, as the cases show a condition of the vision and visual field worse than had been anticipated.

One hundred and fifty-four operations were done on the one hundred and eighty eyes under consideration. Vision was temporarily improved by the iridectomy in both eyes in two cases and in one eye in six cases; but in all eight cases, after a few months, a steady loss of vision and narrowing of the field set in, and continued progressively as long as the patients were under observation. Vision remained unchanged, neither better nor worse, after the operation for a period of one year or longer, in both eyes in eight cases and in one eye in twenty cases. Vision grew slowly and steadily worse after the operation in both eyes in forty-one cases and in one eye in twenty-nine cases. Vision grew rapidly worse after the operation in both eyes in two cases and in one eye in eight cases.

One point in connection with the effect of the operation upon the resultant vision is of some importance, and sufficient attention does not seem to have hitherto been called to it. In those cases in which the lens shows peripheral opacities, whether due to the natural senile change or directly to the interference with the nutrition of the lens induced by the glaucoma, the question would naturally arise, What effect has the iridectomy upon the lenticular opaci-

ties? Peripheral opacities of the lens existed in thirty-five of the one hundred and eighty eyes considered, and repeated examinations showed that the operation had materially hastened the growth of the cataract in twenty eyes, or more than fifty per cent.

Another point elucidated by a study of these cases is that the effect of the operation varies as to vision according to the stage of the disease at the time of the operation. If we limit arbitrarily the early stage of the disease to the first six months, and regard everything beyond this as belonging to the later stages of the disease, it will be seen that the earlier the operation is done the more likely are we to obtain a good result; but to this there are not a few marked exceptions. It will be well in this comparison to regard every case where the existing vision has been maintained after the operation as a good result. A comparison of the results of operation in these cases shows that an early operation gave a good result in both eyes in four cases and in one eye in eight cases. But the reverse of this is somewhat significant—viz., an early operation gave a bad result in both eyes in four cases and in one eye in twelve cases. Now, when we come to consider the later stages of the disease, we find that a late operation gave bad results in both eyes in thirty-four cases and in one eye in twenty-six cases. The reverse of this is, however, significant—viz., a late operation gave a good result in both eyes in three cases and in one eye in eleven cases.

In analyzing the histories of these cases, both individually and collectively, it will be found a difficult matter to draw any satisfactory conclusions as to prognosis after operation. Many of the cases of simple chronic glaucoma are of long duration, even when left entirely untreated. Experience has taught most operators that a large iridectomy often causes serious optical inconvenience, even when the

vision is fairly good, and that in many instances, when the field is much contracted, an iridectomy causes a still further diminution in the size of the field. Furthermore, the state of tension is no reliable guide in forming a prognosis, and bears no constant relation to the condition of the iris or anterior chamber, or to the acuity of vision and state of the visual field. The depth of the excavation in the optic disc bears a very inconstant relation to both the degree of vision and the state of the field, and is almost equally at variance with the condition of intra-ocular tension. It is no uncommon experience to find an almost typical glaucomatous excavation in an eye with perfectly normal vision and visual field, and without another symptom of glaucoma. Yet in these cases Nettleship hints that such an excavation may be of importance, as tending to prove that chronic glaucoma may begin rather in the optic nerve than in the ciliary region, and argues that such suspicious appearances may precede the outbreak of rapid glaucoma. (See "Royal London Ophthalmic Hospital Reports," xii, 2.)

There are several known causes for the failure of the operation to stay the progress of the disease. One of these is some unfavorable process going on in the vicinity of the wound, especially in aged patients or in those in a bad state of health. Another is a more or less marked displacement of the lens by the operation, owing to undue violence or to a weak suspensory ligament, which in its turn leads to the development of cataract, especially in eyes with peripheral opacities already existing in the lens. Another cause, not infrequently seen after an iridectomy done simply for optical purposes, is a slowly progressive haziness of the cornea, extending usually from the site of the wound. This I have not myself met with in any case of glaucoma. Another not infrequent cause, resulting directly from the operation, is the continued contraction of the field of vision.

The opinion is held by some authors that when glaucoma occurs in a myopic eye, it does so early in the patient's life. This has not been my experience. Among the one hundred and eighty eyes under consideration, myopia or myopic astigmatism, or both, was met with in fifteen eyes, occurring among nine patients, and of these nine patients only two were under sixty years of age. This result is directly at variance with the latest statistics published by Nettleship. With regard to the opinion that the prognosis in such cases is especially bad, my experience is not sufficient to justify any conclusion.

The prognosis after operation is also influenced by the condition of the patient's health, and probably also by the location and size of the wound. The farther back from the corneal margin the wound is made, the larger will be the segment of iris removed, and the less the liability of the formation of anterior synechiæ. There are certain opinions held by most ophthalmologists in regard to the so-called cystoid or "filtering" cicatrix—namely, that in desperate cases it is a favorable condition, by allowing free percolation of fluid through the lips of the wound and beneath the conjunctiva and thus aiding in keeping the tension low. This is undoubtedly true in so far as the maintenance of normal tension has a direct influence upon the maintenance of the existing vision. But this is only one of the factors interested in the preservation of the existing vision, and not a few cases of simple chronic glaucoma show a diminished tension from start to finish; and these cases, in the reporter's experience, all end unfavorably.

Conclusions.—In endeavoring to draw some rational conclusions from the study of ninety cases, it seems wise to begin with a quotation from Priestley Smith, to whom ophthalmologists owe so much of their knowledge of the pathogeny and pathology of glaucoma:

1. In considering the expediency of an operation in simple chronic glaucoma he says: "In every case of chronic glaucoma the responsibility of advising an operation is a heavy one, and should on no account be undertaken without a full explanation to the patient or his friends of the almost positive certainty of blindness on the one hand, and of the uncertainties which beset the operation on the other. Having regard to the age of the patient, the impossibility of great benefit, and the possibility of a painful and accelerated progress, a prudent surgeon will only operate on the express desire of the patient to receive the only possible chance of benefit, however small it may be." Armed with the preceding precaution, it seems to be our duty to operate in cases of chronic progressive glaucoma, and the earlier the better.

2. If the disease in a given case seems to be stationary and is still in the primary stage, and if it be possible to test the vision and the visual field at short intervals, delay in operating is permissible, but a weak solution of eserine or pilocarpine should be used daily, merely as an aid in controlling the course of the disease. The examination of these patients should be at short intervals, and should invariably include the tests for visual acuity and the careful examination of the visual field.

3. If the disease exists in both eyes, but with useful vision in both, the eye in which the disease is the more advanced should be operated upon without delay; and the surgeon will be guided in his treatment of the fellow-eye by the result of the operation on the first eye.

4. To insure the best result, the incision should be made well in the sclerotic, with a narrow cataract-knife or a very broad lance-knife, and the entire segment of iris, from one end of the incision to the other, should be carefully torn or excised from its insertion.

5. The most carefully performed iridectomy by skillful

hands is sometimes followed by the rapid loss of what sight still remains, sometimes partial, but, unfortunately, sometimes also total.

6. A successful result is, in the majority of cases, more likely to follow the operation if it is performed early in the course of the disease, but the preservation of the existing degree of vision even in these cases is not invariable.

7. As regards the question of symmetry, it is probable that in the large majority of cases—perhaps as much as eighty per cent.—the disease is sooner or later present in both eyes, and a careful study of the cases seems to establish the fact that there can be no specified or certain interval of time which insures the second eye against an attack.

8. If the patient is old and feeble, and one eye is still free from the disease for a year or more after the other eye has become affected, it may be considered prudent to avoid an operation on the affected eye, as it is probable that the unaffected eye may remain free during the remainder of the patient's life.

9. The condition of the field of vision is no constant guide, either in forming a prognosis as to the progress of the disease or in deciding as to the time of operation.

10. The acuity of vision bears no constant relation to either the success or the failure of the operation.

11. The anterior chamber is usually shallow, is occasionally entirely absent, but is often apparently normal in depth. The condition of the chamber gives no reliable hint as to the state of the vision or the visual field, nor any indication as to prognosis.

12. The appearance and motility of the iris appear to have some bearing upon the prognosis, though not perhaps to the extent believed by Nettleship. The latter states that in the cases in which the iris reacted rapidly to eserine the operation proved successful. This has not always been

the experience of the reporter; but in the majority of the cases in which eserine caused rapid contraction of the pupil, the visual acuity was fairly good and the field was not seriously limited.

13. The depth of the excavation in and the color of the optic disc seem to have no close connection with the defect in vision or with the limitation of the visual field; nor do they offer any constant guide as to prognosis, or to the effect of an operation upon the progress of the disease.

14. The condition of the intra-ocular tension is a very uncertain guide in deciding the time for operating. It may be normal or increased, or even diminished. It does not seem to bear any constant relation to the degree of visual acuity or to the state of the visual field. The steady maintenance of an increased tension, however, without any diminution, almost invariably indicates the necessity for an immediate operation, and this necessity is especially indicated if the tension is continually on the increase.

15. The health and age of the patient exert a decided influence upon the effect of the operation, and any marked evidence of senility is distinctly unfavorable to operation.



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